CLAIMS

1. Process for the production of particle beam systems (10-10'''', 12-12'') in which at least one first particle beam system (10) on a first substrate (14) by particle beam-induced deposition, **characterized in that** at least one second particle beam system (12) is produced on at least one second substrate (16) by the minimum of one first particle beam system (10) using computer-guided, particle beam-induced deposition, whereupon the minimum of one second particle beam system (12) is used to produce at least one additional first particle beam system (10') on the first substrate (14) by computer-guided particle beam-induced deposition.

2. Process according to Claim 1, **characterized in that** first and second particle beams systems (12', 12'', 10'', 10''', 10'''') are produced in alternation by the second and first particle beam systems, respectively, already existing on the substrates (14, 16).

3. Process according to Claim 1 or Claim 2, **characterized in that** the first and the second substrates (14, 16) are offset from each other in such a way that free surfaces (18-18'''') of one substrate (16) are opposite the particle beams systems (10-10'''') already existing on the other substrate (14), so that the particle beam systems (10-10'''') of the one substrate (14) can produce particle beam systems on the free surfaces (18-18'''') of the other substrate (16).

4. Process according to Claim 3, **characterized in that** the substrates (14, 16) are positioned under the control of a computer (20).

5. Process according to Claim 3 or Claim 4, **characterized in that** the substrates (14, 16) are positioned with respect to each other by piezeoelectric elements (22, 24).

6. Process according to one of the preceding claims, **characterized in that** each particle beam system (10-10'''', 12-12'') is tested electrically after it is produced.

7. Process according to one of the preceding claims, **characterized in that**, before the particle beams systems are produced on the substrates, circuit elements (26), especially wiring elements (28), are produced, by means of which at least some of the particle beam systems are electrically connected.

8. Process according to one of the preceding claims, **characterized in that** particle beam systems are produced on contact points (34) provided on a substrate (14).

9. Process according to one of the preceding claims, **characterized in that** particle beam systems are arranged next to each other like the teeth of a comb on a substrate.

10. Process according to one of the preceding claims, **characterized in that** first and/or second particle beam systems evaluate the image signals produced by scanning.

11. Process according to one of the preceding claims, **characterized in that** the focusing, stigmation, and deflection of the particle beam are carried out in an automatic sequence, and in that each particle beam system is focused individually.

12. Process according to one of the preceding claims, characterized in that the deposition is carried out by computer-guided ion beam-induced or electron beam-induced deposition.

13. Process according to one of the preceding claims, **characterized in that** the deposition of the first particle beam system to be produced is carried out by deposition with a computer-guided microscopic scanning probe at low voltages of approximately 100 V to approximately 40 kV.

14. Process according to one of the preceding claims, **characterized in that** the particle beam systems are driven and controlled in groups by a control system comprising electronic control and programming circuitry.

15. Process according to one of the preceding claims, **characterized in that** a certain number of particle beam systems are produced and completely configured, whereupon these particle beam systems, which are arranged in blocks, are suitably supplied with gases and work in parallel to produce additional particle beam systems.

16. Process according to Claim 15, **characterized in that** individual comb-like arrays of particle beam systems are reproduced, assembled into fabrication systems, and configured.

17. Process according to Claim 15 or Claim 16, **characterized in that** the blocks are all produced together in a single process, without the need for further assembly.

18. Process according to one of the preceding claims, **characterized in that** the beam axes of the particle beam systems (see Figures 3-6) are more-or-less perpendicular to the surface of the substrate.

19. Device for the production of particle beam systems (10-10'''', 12-12''), with a first substrate (14), where at least one first particle beam system (10-10''''), produced by computer-guided particle beam-induced deposition, is located on the first substrate (14), **characterized in that** at least one second substrate is provided; in that the first and the minimum of one second substrate (14, 16) are arranged at an offset from each other in such a way that free surfaces (18-18'''') of one substrate (16) are opposite the particle beam systems (10-10'''') already present on the other substrate (14), so that the particle beams systems (10-10'''') of the one substrate (14) can produce particle beam systems on the free surfaces (18-18'''') of the other substrate (16).

20. Device according to Claim 19, **characterized by** a computer (20), which is set up for programming in such a way that it can control the positioning of the substrates (14, 16).

21. Device according to Claim 20, **characterized by** piezeoelectric elements (22, 24) for the substrates (14, 16), which make it possible to position the substrates with respect to each other under computer control after evaluation of the image of the free base points.

22. Device according to one of Claims 19-21, **characterized by** testing means, such as means for image reproduction, means for detection and display of electrical current and secondary electron values, and other display means, which are designed to test each particle beam system (10-10'''', 12-12'') on the substrates (14, 16).

23. Device according to one of Claims 19-22, **characterized in that** the first and second substrates (14, 16) are semiconductors, especially silicon.

24. Device according to one of the preceding Claims 19-22, **characterized in that** the first and second substrates (14, 16) are nonconductors, especially glass, ceramic, or quartz.

25. Device according to one of Claims 19-24, **characterized in that** the substrate has circuit elements (26), especially wiring elements (28), by means of which at least some of the particle beam systems are electrically connected.

26. Device according to Claim 25, **characterized in that** the circuit elements comprise in particular computer-controlled particle beam current controllers, heating current controllers, particle beam deflection amplifiers, aperture deflection amplifiers, scanner generators, function generators with memory, lens adjusting means, lens voltage amplifiers, image signal amplifiers, astigmatism voltage amplifiers, and/or deflection voltage amplifiers.

27. Device according to Claim 25 or Claim 26, **characterized in that** the circuit elements are in particular computer components such as central processing units, computer memory, cache memory, data memory, and circuits which perform routines

stored in hardware, namely, the routines which make possible and are required for the reproduction of the systems, for image acquisition and evaluation, and for the production of special new systems.

28. Device according to Claim 27, **characterized in that** the circuit elements which make possible and are required for the reproduction of the systems, for image acquisition and evaluation, and for the production of special new systems can be added sequentially by the multiplex method to the particle beam systems to be individually fabricated so that these systems can be controlled.

29. Device according to one of Claims 19-28, **characterized in that,** to hold a particle beam system (30), a substrate has a surface (32) with a width of approximately 2 μm to approximately 2,500 μm and a length of approximately 10 μm to approximately 100 mm.

30. Device according to one of Claims 19-29, **characterized in that** a substrate (14) has contact points (34) for particle beam systems.

31. Device according to one of Claims 19-30, **characterized in that** particle beam systems are arranged next to each other like the teeth of a comb on a substrate.

32. Device according to one of Claims 19-31, **characterized in that** at least one first and at least one second particle beam system are equipped with measuring and stabilizing circuits, which serve to measure and to stabilize the particle beam radiation.

33. Device according to one of Claims 19-32, **characterized in that** circuit elements are provided which supply the particle beam systems with voltage and current and which can be adjusted and programmed by data in memory.

34. Device according to one of Claims 19-33, **characterized in that** the particle beam systems are provided with means designed to execute an automated testing

procedure, which ensures the functionality and stability of the radiation, of image recording, and of image evaluation.

35. Device according to one of Claims 19-34, **characterized in that** the particle beam systems are connected to image display means such as picture screens or large-format screens, where the image is divided in correspondence with the individual particle beam systems, so that the work of the system can be monitored and the results made available for use elsewhere.

36. Device according to Claim 35, **characterized in that** the image display means have data-reduction routines to support the monitoring process and to guarantee that essentially the only data which must be stored are error data.

37. Device according to one of Claims 19-36, **characterized in that** the particle beam systems have electron sources or gas or liquid ion sources.

38. Use of a process according to one of Claims 1-18 and/or of a device according to one of Claims 19-37 for the production of two-dimensional arrays of components, especially the components of a resistance matrix for a flat camera, of a flat display screen with particle beam sources, of lens arrays, of high-current emitter arrays with low switching voltage for controlling current; of micro-electron tubes of all types, and of read/write arrangements for memory units.